What is claimed is:

1.   A process for performing total knee arthroplasty surgical operations on
portions of a knee joint, comprising:

(a) obtaining data corresponding to structure of a body part forming a portion of said joint with a locator, wherein the body part and part of the locator are each attached to a fiducial capable of being tracked by at least one position sensor;

(b) registering a surgical instrument attached to a fiducial capable of being tracked by at least one position sensor;

(c) using a computer which receives signals from the at least one sensor, tracking position and orientation of the surgical instrument relative to the body part;

(d) generating and displaying on a monitor associated with the computer a visual image of the instrument properly positioned and oriented relative to the body part;

(e) navigating the surgical instrument relative to the body part and attaching the surgical instrument to the body part according to the image;

(f) modifying the body part using the surgical instrument attached to the body part; and

(g) assessing performance of the joint using images displayed on said monitor.

2.   The process of claim 1, further comprising registering a body part by intraoperatively designating at least one point on the body part with a probe, wherein the probe is attached to a fiducial capable of being tracked by said at least one position sensor.

3.   The process of claim 1, wherein the body part comprises one of a femur, a tibia and a patella.

4.   The process of claim 1, wherein the locator comprises one of a C-arm fluoroscope, a CT scanner, MRI equipment, ultrasound equipment, laser scanning equipment and a probe.

5   5.   The process of claim 1, wherein the fiducials comprise one of active fiducials, passive fiducials and hybrid active/passive fiducials.

6.   The process of claim 1, wherein the position tracking sensors comprise one of infrared sensors, electromagnetic sensors, electrostatic sensors, light
10   sensors, sound sensors, and radiofrequency sensors.

7.   The process of claim 1, wherein the surgical instrument comprises a rod and a cutting block.

15   8.   A process for performing total knee arthroplasty surgical operations on portions of a knee joint comprising:

(a) obtaining data corresponding to structure of a body part forming a portion of said joint with a locator, wherein the body part and the locator are each attached to a fiducial capable of being tracked by at least one position
20   sensor;

(b) registering a surgical instrument attached to a fiducial capable of being tracked by at least one position sensor;

(c) using a computer which receives signals from the at least one sensor, tracking position and orientation of the surgical instrument relative to
25   the body part;

(d) generating and displaying on a monitor associated with the computer a visual image of the instrument properly positioned and oriented relative to the body part;

(e) navigating the instrument relative to the body part and attaching the
30   instrument to the body part according to the image;

(f) modifying the body part using the instrument attached to the body part;

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(g) removing the instrument from the body part;

(h) registering a trial component attached to a fiducial capable of being tracked by at least one position sensor;

(i) tracking position and orientation of the trial component relative to the body part;

(j) generating and displaying on the monitor a visual image of the trial component properly positioned and oriented relative to the body part;

(k) navigating and installing the trial component on the body part according to the image; and

(l) assessing performance of the knee joint using images displayed on the monitor.

9.   The process of claim 8, further comprising:

(a) discontinuing tracking of the trial component using the fiducial attached to the trial component; and

(b) initiating tracking of the trial component using the fiducial attached to the body part on which the trial component is installed.

10.   The process of claim 8, wherein the body part comprises one of a femur, a tibia and a patella.

11.   The process of claim 8, wherein the locator comprises one of a C-arm fluoroscope, a CT scanner, MRI equipment, ultrasound equipment, laser scanning equipment and a probe.

12.   The process of claim 8, wherein the fiducials comprise one of active fiducials, passive fiducials and hybrid active/passive fiducials.

13.   The process of claim 8, wherein the position/orientation tracking sensors comprise at least one of infrared sensors, electromagnetic sensors, electrostatic sensors, light sensors, sound sensors, and radiofrequency sensors.

14.   The process of claim 8, wherein the trial component comprises a femoral component.

5   15.   The process of claim 8, further comprising:

(a) performing soft tissue balancing tests while the computer continues to track the fiducials;

(b) using data generated by the computer, including information related to at least one of release points and amounts, to assess alignment and

10   stability of the trial component and the knee joint; and

(c) releasing soft tissue to adjust alignment and stability of the knee joint.

16.   A process for performing total knee arthroplasty surgical operations on

15   portions of a knee joint comprising:

(a) obtaining data corresponding to the structure of a body part forming a portion of said joint with a locator, wherein the body part and the locator are each attached to a fiducial capable of being tracked by at least one position sensor;

20   (b) registering a total knee arthroplasty trial component attached at least indirectly to a fiducial capable of being tracked by at least one position sensor;

(c) using a computer which receives signals from the at least one sensor, tracking position and orientation of the trial component relative to the

25   body part; and

(d) generating and displaying on a monitor associated with the computer a visual image of the trial component properly positioned and oriented relative to the body part.

30   17.   A process for performing total knee arthroplasty surgical operations on portions of a knee joint comprising:

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(a) obtaining data corresponding to structure of a body part forming a portion of said joint with a locator, wherein the body part and the locator are each attached to a fiducial capable of being tracked by at least one position sensor;

5   (b) registering a total knee arthroplasty implant trial component attached at least indirectly to a fiducial capable of being tracked by at least one position sensor;

(c) using a computer which receives signals from the at least one sensor, tracking position and orientation of the trial component relative to the 10 body part;

(d) generating and displaying on a monitor associated with the computer a visual image of the trial component properly positioned and oriented relative to the body part;

(e) navigating the trial component relative to the body part and 15 attaching the trial component to the body part according to the image;

(f) performing soft tissue balancing tests while the computer continues to track the fiducials;

(g) using data generated by the computer to assess alignment and stability of the joint with the trial component attached; and

20   (h) releasing soft tissue to adjust alignment and stability.

18.   A process for performing total knee arthroplasty surgical operations on portions of a knee joint comprising:

(a) obtaining data corresponding to structure of a body part forming a 25 portion of said joint with a locator, wherein the body part and the locator are each attached to a fiducial capable of being tracked by at least one position sensor;

(b) registering a total knee arthroplasty implant component attached at least indirectly to a fiducial capable of being tracked by at least one position 30 sensor;

(c) using a computer which receives signals from the at least one position sensor, tracking position and orientation of the implant component relative to the body part;

(d) generating and displaying on a monitor associated with the computer a visual image of the implant component properly positioned and oriented relative to the knee joint; and

(e) navigating the implant component relative to the body part and attaching the implant component to the body part according to the image.

19.   The process of claim 18, further comprising performing soft tissue balancing tests on the joint with implant component installed while the computer continues to track the fiducials.

20.   A process for performing total knee arthroplasty surgical operations on portion of a knee joint comprising:

(a) obtaining data corresponding to structure of a body part forming a portion of said joint with a locator, wherein the body part and the locator are each attached to a fiducial capable of being tracked by at least one position sensor;

(b) registering a total knee arthroplasty implant component attached to a tool to which is attached a fiducial capable of being tracked by at least one position sensor;

(c) using a computer which receives signals from the at least one sensor, tracking position and orientation of the implant component relative to the body part;

(d) generating and displaying on a monitor associated with the computer a visual image of the implant component properly positioned and oriented relative to the body part;

(e) navigating the implant component relative to the body part and attaching the implant component to the body part according to the image;

(f) discontinuing tracking of the implant component using the fiducial attached to the tool;

(g) initiating tracking of the implant component using the fiducial attached to the body part on which the implant component is attached;

(h) performing soft tissue balancing tests while the computer continues to track the fiducials; and

5   (i) using data generated by the computer to assess alignment and stability of the joint with the implant installed.

21.   A system for performing total knee arthroplasty surgical operations on portions of a knee joint comprising:

10   (a) an imager for obtaining an image of a femur, wherein the imager and the femur are each attached to a fiducial capable of being tracked by a position sensor;

(b) at least one position sensor adapted to track position of said fiducials;

15   (c) a computer adapted to store at least one image of the femur and to receive information from said at least one sensor in order to track position and orientation of said fiducials and thus the femur;

(d) an extramedullary rod adapted to be attached to a femur using an impactor, said impactor attached to a fiducial, whereby the position of the 20 extramedullary rod is capable of being tracked by said sensor and the position and orientation of the rod is capable of being tracked by said computer; and

(e) a monitor adapted to receive information from the computer in order to display at least one image of said extramedullary rod positioned and oriented relative to the femur for navigation and positioning of the rod on the 25 femur.

22.   A system for performing total knee arthroplasty surgical operations on portions of a knee joint comprising:

(a) an imager for obtaining an image of a femur, wherein the imager 30 and the femur are each attached to a fiducial capable of being tracked by a position sensor;

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(b) at least one position sensor adapted to track position of said fiducials;

(c) a computer adapted to store at least one image of the femur and to receive information from said at least one sensor in order to track position and orientation of said fiducials and thus the femur;

(d) a medullary rod adapted to be attached to a femur using an impactor, said impactor attached to a fiducial, whereby the position of the medullary rod is capable of being tracked by said sensor and the position and orientation of the rod is capable of being tracked by said computer; and

(e) a monitor adapted to receive information from the computer in order to display at least one image of said medullary rod positioned and oriented relative to the femur for navigation and positioning of the rod on the femur.

23.   A system for performing total knee arthroplasty surgical operations on portions of a knee joint comprising:

(a) a locator for obtaining data corresponding to the structure of bone, wherein the locator and the bone are each attached to a fiducial capable of being tracked by a position sensor;

(b) at least one position sensor adapted to track position of said fiducials;

(c) a computer adapted to store data relating to structure of the bone and to receive information from said at least one sensor in order to track position and orientation of said fiducials and thus the bone;

(d) a total knee arthroplasty surgical instrument adapted to be associated with a fiducial which is attached to bone, whereby the position and orientation of the instrument is capable of being tracked by said sensor; and

(e) a monitor adapted to receive information from the computer in order to display at least one image of the instrument and a total knee arthroplasty implant component corresponding to said instrument, positioned and oriented relative to the knee joint for navigation and positioning of the instrument on the bone.

24.   A system for performing total knee arthroplasty surgical operations on portions of a knee joint comprising:

(a) an imager for obtaining an image of a femur, wherein the imager and the femur are each attached to a fiducial capable of being tracked by a position sensor;

(b) at least one position sensor adapted to track position of said fiducials;

(c) a computer adapted to store at least one image of the femur and to receive information from said at least one sensor in order to track position and orientation of said fiducials and thus the femur;

(d) a femoral trial implant whose position is capable of being tracked by said sensor and whose position and orientation is capable of being tracked by said computer; and

(e) a monitor adapted to receive information from the computer in order to display at least one image of said femoral trial implant positioned and oriented relative to the femur for navigation and positioning of the trial implant on the femur.

25.   A system for performing total knee arthroplasty surgical operations on portions of a knee joint comprising:

(a) an imager for obtaining an image of a tibia, wherein the imager and the tibia are each attached to a fiducial capable of being tracked by a position sensor;

(b) at least one position sensor adapted to track position of said fiducials;

(c) a computer adapted to store at least one image of the tibia and to receive information from said at least one sensor in order to track position and orientation of said fiducials and thus the tibia;

(d) a tibial trial implant whose position is capable of being tracked by said sensor and whose position and orientation is capable of being tracked by said computer; and

(e) a monitor adapted to receive information from the computer in order to display at least one image of said tibial trial implant positioned and oriented relative to the body part for navigation and positioning of the trial implant on the tibia.

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26.   A system for performing total knee arthroplasty surgical operations on portions of a knee joint comprising:

(a) an imager for obtaining an image of a femur, wherein the imager and the femur are each attached to a fiducial capable of being tracked by a

10   position sensor;

(b) at least one position sensor adapted to track position of said fiducials;

(c) a computer adapted to store at least one image of the femur and to receive information from said at least one sensor in order to track position and

15   orientation of said fiducials and thus the femur;

(d) a femoral implant capable of being mounted on a tool, said tool attached to a fiducial, whereby the position of the femoral implant is capable of being tracked by said sensor and the position and orientation of the implant is capable of being tracked by said computer; and

20   (e) a monitor adapted to receive information from the computer in order to display at least one image of said femoral implant positioned and oriented relative to the femur for navigation and positioning of the implant on the femur.

27.   A system for performing total knee arthroplasty surgical operations on

25   portions of a knee joint comprising:

(a) an imager for obtaining an image of a tibia, wherein the imager and the tibia are each attached to a fiducial capable of being tracked by a position sensor;

(b) at least one position sensor adapted to track position of said

30   fiducials;

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(c) a computer adapted to store at least one image of the tibia and to receive information from said at least one sensor in order to track position and orientation of said fiducials and thus the tibia;

(d) a tibial implant capable of being mounted on an impactor, said impactor attached to a fiducial, whereby the position of the tibial implant is capable of being tracked by said sensor and the position and orientation of the implant is capable of being tracked by said computer; and

(e) a monitor adapted to receive information from the computer in order to display at least one image of said tibial implant positioned and oriented relative to the femur for navigation and positioning of the implant on the tibia.

28.   A system for performing total knee arthroplasty surgical operations on portions of a knee joint comprising:

(a) a locator for obtaining data corresponding to structure of a femur, wherein the locator and the femur are each attached to a fiducial capable of being tracked by a position sensor;

(b) at least one position sensor adapted to track position of said fiducials;

(c) a computer adapted to store at least one image of the femur and to receive information from said at least one sensor in order to track position and orientation of said fiducials and thus the femur;

(d) a total knee arthroplasty surgical instrument whose position is capable of being tracked by said sensor and whose position and orientation is capable of being tracked by said computer;

(e) a femoral trial implant capable of being mounted on a tool, said tool attached to a fiducial, whereby the position of the femoral trial implant is capable of being tracked by said sensor and the position and orientation of the trial implant is capable of being tracked by said computer;

(f) a femoral implant capable of being mounted on a tool, said tool attached to a fiducial, whereby the position of the femoral implant is capable of being tracked by said sensor and the position and orientation of the implant is capable of being tracked by said computer; and

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(g) a monitor adapted to receive information from the computer in order to display at least one image of said instrument, at least one image of said femoral trial implant and at least one image of said femoral implant positioned and oriented relative to the femur for navigation and positioning of the instrument, the trial implant, and the implant on the femur.

29.　A system for performing total knee arthroplasty surgical operations on portions of a knee joint comprising:

(a) a locator for obtaining data corresponding to structure of a tibia, wherein the locator and the tibia are each attached to a fiducial capable of being tracked by a position sensor;

(b) at least one position sensor adapted to track position of said fiducials;

(c) a computer adapted to store at least one image of the tibia and to receive information from said at least one sensor in order to track position and orientation of said fiducials and thus the tibia;

(d) a total knee arthroplasty surgical instrument whose position is capable of being tracked by said sensor and whose position and orientation is capable of being tracked by said computer;

(e) a tibial trial implant capable of being mounted on a tool, said tool attached to a fiducial, whereby the position of the tibial trial implant is capable of being tracked by said sensor and the position and orientation of the trial implant is capable of being tracked by said computer;

(f) a tibial implant capable of being mounted on a tool, said tool attached to a fiducial, whereby the position of the tibial implant is capable of being tracked by said sensor and the position and orientation of the implant is capable of being tracked by said computer; and

(g) a monitor adapted to receive information from the computer in order to display at least one image of said instrument, at least one image of said tibial trial implant and at least one image of said tibial implant positioned and oriented relative to the femur for navigation and positioning of the instrument, the trial implant and the implant on the tibia.

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